

# Strategy Research Project

## Analysis of Alternatives Mandate for the Milestone A Decision

by

Mr. Barry E. Bazemore  
Department of Army Civilian



United States Army War College  
Class of 2013

### DISTRIBUTION STATEMENT: A

Approved for Public Release  
Distribution is Unlimited

This manuscript is submitted in partial fulfillment of the requirements of the Master of Strategic Studies Degree. The views expressed in this student academic research paper are those of the author and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. Government.

The U.S. Army War College is accredited by the Commission on Higher Education of the Middle States Association of Colleges and Schools, 3624 Market Street, Philadelphia, PA 19104, (215) 662-5606. The Commission on Higher Education is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation.

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
<p>The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. <b>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</b></p>					
1. REPORT DATE (DD-MM-YYYY) xx-03-2013		2. REPORT TYPE STRATEGY RESEARCH PROJECT		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE Analysis of Alternatives Mandate for the Milestone A Decision				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Mr. Barry E. Bazemore Department of Army Civilian				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Professor Louis G. Yuengert Department of Command, Leadership, and Management				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army War College 122 Forbes Avenue Carlisle, PA 17013				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution A: Approved for Public Release. Distribution is Unlimited.					
13. SUPPLEMENTARY NOTES Word Count: 7340					
14. ABSTRACT In May of 2009, Congress unanimously passed and the President signed into law, the Weapon Systems Acquisition Reform Act of 2009 (WSARA). In WSARA, Congress sought to minimize waste and inefficiency in the Defense Acquisition System (DAS) by focusing on more robust, cost informed decision making earlier in the acquisition process. Among other significant organizational and policy changes, WSARA mandated an analysis of alternatives (AoA) for certifying the Milestone A acquisition decision. To effectively implement the WSARA analysis requirement for Milestone A, the Office of the Secretary of Defense (OSD) and the Army must clearly define and gain shared understanding about expectations for the Milestone A analysis of alternatives. Success depends on clearly communicating and consistently enforcing standards of performance among the community which plans, prepares and conducts the analyses, as well as establishing realistic expectations among those whom the work informs.					
15. SUBJECT TERMS WSARA, Cost, Schedule, Performance, Technology Readiness, Concepts, Defense Acquisition System					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT  UU	18. NUMBER OF PAGES  38	19a. NAME OF RESPONSIBLE PERSON
a. REPORT UU	b. ABSTRACT UU	c. THIS PAGE UU			19b. TELEPHONE NUMBER (Include area code)



# USAWC STRATEGY RESEARCH PROJECT

## **Analysis of Alternatives Mandate for the Milestone A Decision**

by

Mr. Barry E. Bazemore  
Department of Army Civilian

Professor Louis G. Yuengert  
Department of Command, Leadership, and Management  
Project Adviser

This manuscript is submitted in partial fulfillment of the requirements of the Master of Strategic Studies Degree. The U.S. Army War College is accredited by the Commission on Higher Education of the Middle States Association of Colleges and Schools, 3624 Market Street, Philadelphia, PA 19104, (215) 662-5606. The Commission on Higher Education is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation.

The views expressed in this student academic research paper are those of the author and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. Government.

U.S. Army War College  
CARLISLE BARRACKS, PENNSYLVANIA 17013



## **Abstract**

Title: Analysis of Alternatives Mandate for the Milestone A Decision

Report Date: March 2013

Page Count: 38

Word Count: 7340

Key Terms: WSARA, Cost, Schedule, Performance, Technology Readiness, Concepts, Defense Acquisition System

Classification: Unclassified

In May of 2009, Congress unanimously passed and the President signed into law, the Weapon Systems Acquisition Reform Act of 2009 (WSARA). In WSARA, Congress sought to minimize waste and inefficiency in the Defense Acquisition System (DAS) by focusing on more robust, cost informed decision making earlier in the acquisition process. Among other significant organizational and policy changes, WSARA mandated an analysis of alternatives (AoA) for certifying the Milestone A acquisition decision. To effectively implement the WSARA analysis requirement for Milestone A, the Office of the Secretary of Defense (OSD) and the Army must clearly define and gain shared understanding about expectations for the Milestone A analysis of alternatives. Success depends on clearly communicating and consistently enforcing standards of performance among the community which plans, prepares and conducts the analyses, as well as establishing realistic expectations among those whom the work informs.





## **Analysis of Alternatives Mandate for the Milestone A Decision**

The Defense Acquisition System (DAS), the Planning, Programming, Budgeting, and Execution (PPBE) process, and the Joint Capabilities Integration and Development System (JCIDS) are decision support systems for Department of Defense (DOD) strategic decision making about force capabilities. In combined effect, they facilitate systems thinking among DOD senior leaders and staffs to minimize risk in pursuing America's national military strategic aims. Among these three interrelated systems, the DAS develops materiel solutions to address current or anticipated future force capability gaps or shortcomings. The acquisition process comprises a series of sequential management decisions that guide development, fielding and support of materiel for the nation's armed forces. Key among these decisions are acquisition milestone decisions within the authority of DOD and Service Acquisition Executives who determine the progress in the life cycle of weapon systems development. In broader strategic context, the DAS represents DOD's ways to achieve strategic ends in terms of materiel based force capability. In a narrower context, the milestone decisions attendant to each acquisition program represent cumulative and contributing strategic decision making about equipping the force. Like many critical DOD management systems, the DAS receives frequent scrutiny for the purpose of improving its effectiveness. The Weapons Systems Acquisition Reform Act of 2009 (WSARA) is the government's most recent attempt to reform the Department's weapons development and procurement processes.

In 2009, Congress unanimously passed the WSARA and on May 22, 2009, President Obama signed it into law, a statute that he said aims to "eliminate some of the waste and inefficiency in our defense projects..."<sup>1</sup> In passing the WSARA, Congress sought to minimize waste and inefficiency by focusing the DAS on more robust, cost

informed decision making earlier in the acquisition process. Among other significant organizational and policy changes, the legislation mandates an analysis of alternatives (AoA) for certifying a Milestone A acquisition decision.

The AoA is a decision support tool used to inform Army and DOD leaders' decisions which contribute to achieving Departmental strategic acquisition goals. The AoA compares the operational effectiveness, suitability, and life-cycle costs among potential alternative solutions to capability needs.<sup>2</sup> While this new statutory requirement may be viewed as unnecessary Congressional oversight and redundant of existing policy, DOD's implementation of this specific aspect of WSARA is an opportunity to effect change in the Department's ability to acquire needed capabilities. Notwithstanding arguments about the utility and perhaps the burden of the new requirement, as Peter Eide and Chuck Allen observe when writing about previous attempts to reform the acquisition system, DOD and Army leaders have "...the professional obligation to drive improvements with clear change visions."<sup>3</sup> The Milestone A AoA mandate requires DOD leaders to interpret national strategic direction and convey intent to those planning and conducting analyses which informs decision-making.

To effectively implement the WSARA analysis requirement for Milestone A certification, the Office of the Secretary of Defense (OSD) and the Army must clearly define and gain shared understanding about expectations for the Milestone A-AoA. The challenge is to effect the intended improvement in processes by establishing codified guidelines which are adequate to purpose in a bureaucratic organization and environment which are inherently resistant to change. Success depends on clearly communicating and consistently enforcing standards of performance among the

community which plans, prepares and conducts the analyses as well as establishing realistic expectations among those whom the work informs. Changing the micro culture which is the DOD analytical community is possible given a focused purpose and understanding of the desired change vector.

The Defense Acquisition System has undergone many major changes in policy and management in the last 40 years.<sup>4</sup> Similarly, the associated decision analysis requirements have changed in content, form and name.<sup>5</sup> To be clear though, in the context of historical practice, the WSARA mandate for an AoA at Milestone A represents the most prescriptive direction for performing analysis associated with a milestone decision. From that perspective, WSARA isn't just another change to the DOD 5000 series of policy and regulatory documents. It is a new way of business. The focus of this research is on the nature of pre-milestone analysis conducted to inform the Milestone A decision.

This research report introduces the new Milestone A paradigm within parameters of WSARA relevant to the AoA requirement, discusses the milestone environment and decision needs, and reviews perceived AoA expectations of senior leaders. It discusses challenges to meeting those expectations and uses synopses of previously completed AoAs to illustrate key points about practical realities for analyses informing program decisions. A review of existing policy guidance, a discussion about practical expectations relative to the deliverables for pre-Milestone A analysis and thoughts about resourcing the Army's AoA mission precede closing with research conclusions and a small set of recommendations.

## The New Paradigm

With regard to the Milestone A decision, WSARA requires the defense acquisition executive to certify “that an analysis of alternatives has been performed consistent with the study guidance developed by the Director of Cost Assessment and Program Evaluation (DCAPE).”<sup>6</sup> Both this requirement and the WSARA provision for the newly established DCAPE to lead study guidance development for AoAs for Joint Requirements Oversight Council (JROC) validated requirements shifts responsibilities among offices within OSD and the Services, resulting in second- and third-order effects.<sup>7</sup> WSARA resulted in a new way of doing business. From the Army’s perspective, these combined requirements impinge on previously exercised Service discretion in developing information and analysis needs tailored to inform acquisition decisions. The change introduces potential for the resulting AoA to diminish focus on the specific Army decision issues at hand; in practice to date, the Cost Assessment and Program Evaluation (CAPE)-developed guidance has often included analysis requirements outside the scope of the typical AoA effort and duplicative of other program requirements, burdening the AoA study team with tasks more appropriately within the realm of the materiel development community rather than the analytic community.<sup>8</sup> The crux of the challenge to solve is to determine what appropriately constitutes a Milestone A AoA and what meets the analysis needs to inform the milestone decision.

As briefly mentioned above, analysis requirements associated with weapon systems acquisition have accommodated the significant policy changes of the Defense Acquisition System over the years. The current AoA’s analytical study predecessor, the Cost and Operational Effectiveness Analysis (COEA), informed acquisition program

milestone decisions prior to roughly 1996.<sup>9</sup> OSD and Army acquisition policy documents over those years variously included detailed guidance about the purpose and manner of performing COEA/AoAs. Compared to policy of the early 1990s, subsequently and currently published OSD and Department of the Army level guidance about the conduct of AoAs has tended to be minimalist in nature.<sup>10</sup> That level of guidance has proven adequate, enabling Service discretion to focus resources on the most critical decision needs and tailor AoAs to investigate tipping point issues driving the milestone decision. The WSARA driven change in the Milestone A environment merits a deliberate review of the sufficiency of current formal guidance about the purpose and conduct of AoAs.

#### The Milestone A Environment and Decision Needs

Just as the purposes of milestone decisions differ, so do the analysis needs which the associated AoA suffice. The nature of performance data and cost information available, and the associated reasonable expectations of the nature of conclusions and outcomes provide context for the identifying and comparing acquisition analysis needs. The Milestone A decision and completion of the associated AoA culminate the materiel solution analysis (MSA) phase of the Defense Acquisition Management System<sup>11</sup> and authorize entry into the Technology Development (TD) phase. According to DOD instruction (DODI 5000.02) which guides the operation of the acquisition system, the milestone's AoA is purposed "to assess the potential materiel solutions to satisfy the capability need documented in the approved Initial Capabilities Document (ICD)."<sup>12</sup> The Milestone B decision comes at the completion of the TD phase and normally initiates a formal acquisition program.<sup>13</sup> The AoA associated with Milestone B must update the Milestone A AoA as necessary.<sup>14</sup> The seemingly innocuous requirement for the Milestone A AoA to be updated as necessary belies the significant difference in the

nature of the two analysis environments associated with materiel solutions analysis and technology development. The distinguishable characteristics of the MSA and TD phases represent the crux of the need to shape senior leader and decision authority expectations regarding the mandated Milestone A AoA. In six identifiable analysis categories, there are clear and substantive distinctions between MSA leading to Milestone A and TD, leading to Milestone B. Those categories are: alternatives, life cycle costs, attributes/requirements, industry involvement, system integration, and operational benefit.<sup>15</sup>

Regarding alternative solutions under consideration, MSA evaluates competing technologies in context of a variety of existing and developing technologies and systems with varying degrees of maturity and confidence levels. In TD the focus is on competing systems which typically comprise a set ranging from design concepts to commercial or government off the shelf (COTS/GOTS), including the influence of TD prototypes.

For life cycle costs, MSA relies on rough order of magnitude (ROM) estimates with lower confidence and uses cost estimating ratios based on historical data. Based on engineering level data and industry proposals, program and item level costing with higher confidence is available in TD. This difference is especially critical in a post WSARA context where more robust analysis informing cost conscious decisions are expected earlier in the acquisition process. ROM estimates may not be sufficient for expectations of milestone decision authorities and their supporting staffs.

During MSA, approved force capability gaps presented in the ICD drive identification of acceptable capability attributes to mitigate those gaps and the associated threshold values to inform the initial drafting of the Capability Development

Document (CDD). TD activities evaluate the threshold values of the key performance parameters and key system attributes to inform development of the final CDD which is a user requirement and guides system development beyond Milestone B.

With respect to industry involvement, MSA activities rely on requests for information (RFIs) and requests for proposals (RFPs) to industry, to include for systems concept definition. Generally members of industry are not under government contract during this phase. During TD, analysis activities leverage program manager (PM) data from technology demonstrations and may rely on RFI if required. In this phase the government has industry under contract to build and test prototype systems for PM evaluation.

System integration during MSA focuses on identifying integration and technical risk. Efforts consider a wide range of potential technologies that may not yet be integrated into a system or concept design. The TD focus expands to identifying production risk in addition to integration and technical risk.

In the area of operational benefit, the MSA focus is generally on technology performance, examining benefits in terms of technology contributions to capability gap mitigation and operational impact. In the TD phase, analysis efforts examine the operational effectiveness or impact of each proposed alternative solution as part of its unit of employment within realistic future operating environments. The differences discussed in these six categories result substantially from the state and availability of knowledge as a function of time. Over time in the materiel acquisition process, actionable knowledge about the problem and its possible solutions mature in both quality and quantity, with corresponding increasing utility for decision-making. At the

acquisition policy levels within OSD, WSARA related expectations about the Milestone A AoA may not reflect a full appreciation of this practical reality.

#### Senior Leader Expectations of the Milestone A AoA

Senior leader published comments coincident with and subsequent to enacting WSARA provide insight into expectations for the Milestone A AoA. In the Spring of 2010, following her November 2009 Senate confirmation as the first Director of the WSARA created CAPE Directorate in OSD, the Honorable Christine H. Fox shared her thoughts about the role of CAPE in facilitating Secretary of Defense decision making.<sup>16</sup> Related to WSARA she mentioned provisions for a number of specific requirements in the legislation, among them, "...realistic cost estimation throughout the acquisition cycle."<sup>17</sup> Regarding analyses of alternatives, she identified an AoA as "a vital step in the acquisition process, in that it can identify the cost effectiveness of alternative means to address requirements identified by the JROC."<sup>18</sup>

She also relates the strengthening of CAPE's role in the AoA process associated with WSARA directed responsibility for developing AoA guidance and the requirement for the conduct of a compliant AoA prior to Milestone A. She goes on to express that the intent of this provision is "...to give the milestone decision authority more information about potential tradeoffs between cost, schedule, and performance, thereby enabling better informed decisions earlier in the program's life cycle."<sup>19</sup>

More recently, in a March 29, 2012 nomination hearing for appointment as Assistant Secretary of Defense for Acquisition, the Honorable Katharina McFarland responded to questions about the provisions and implementation of WSARA. In her prepared responses she had the opportunity to express her views on a number of aspects of WSARA and its implementation. Five of those prepared responses related to



expectations in the context of analysis to inform the Milestone A acquisition decision or to the notion of improving acquisition outcomes by making more cost conscious decisions earlier in the acquisition process. Her response to a question about ensuring collaboration between the requirements and acquisition communities to understand and control operations and support costs clearly articulated the outlines of her expectations about the Milestone A AoA. She acknowledged her expectation that the ICD would be sufficiently detailed to convey capability requirements for the AoA. She reinforced that in conjunction with JCIDS, WSARA placed a “premium within the Department on conducting a thorough, rigorous AoA prior to initiating large acquisition programs.”<sup>20</sup> Referring to the necessity for the AoA to fully consider trade-offs among cost, schedule, and performance, she indicated the requirement had already resulted in improved analysis of those parameters as well as program risk. Further, that the AoA results provided foundation for an informed decision at Milestone A.<sup>21</sup>

About unrealistic cost, schedule and performance expectations, she cites acquisition experts as attributing failure of DOD programs to a “cultural bias that routinely produces overly optimistic cost and schedule estimates and unrealistic performance expectations.”<sup>22</sup> She attributes section 201 of WSARA, which includes Milestone A AoA mandate provisions, as seeking “to address this problem by promoting early consideration of trade-offs among cost, schedule and performance objectives in major defense acquisition programs.”<sup>23</sup> She offered that implementing “Affordability Targets at Milestone A, Affordability Requirements at Milestone B, and working to build realistic schedules and hold programs to them”<sup>24</sup> as steps to increase funding and requirements stability of major programs.

Specifically with regard to the Army's Ground Combat Vehicle Program, responding to a question about how effectively new programs had complied with WSARA, she confirmed that DOD had "abided by the tenets and implemented the requirements of WSARA"<sup>25</sup> and that the Milestone A certification provides an enforcement means. When asked about potentials for improvement, she suggested possible "revisions to Department of Defense Instructions (DODI) 5000.02, which governs the defense acquisition system."<sup>26</sup> From these expressed views about WSARA and specifically about the Milestone A AoA, it is clear both these senior DOD acquisition officials expect significantly robust analysis and its attendant contribution, to better inform cost, performance and schedule considerations coincident with the Milestone A decision. Achieving such expectations of the Milestone A AoA is not without challenges which may portend practical results that are inconsistent with expectations.

#### Milestone A AoA Challenges<sup>27</sup>

Without an approved Capability Development Document and industry proposals, three critical challenges impact the ability to deliver an AoA which meets expectations conveyed in WSARA and reflected in the comments of the senior OSD acquisition officials. An approved CDD and substantive industry involvement are atypical prior to the start of the Technology Development phase.

The first among the three challenges relates to system attribute and performance which are the basis for trade analysis during the Materiel Solutions Analysis (MSA) phase. The ability to create early and sufficient concept models of integrated technologies in order to derive estimates for these attributes and performance, even rough order of merit (ROM), is crucial to achieving useful analytical results. This is

challenging because knowledge about capability requirements is immature during this phase and candidate technology solutions may still be in development.

Second, MSA considers wide ranging sets of alternatives among technologies, design concepts, modernized systems, non-developmental items (NDI), and COTS/GOTS items. An NDI is a previously developed item used exclusively for federal, State, or local government purposes or by a foreign government with which the United States has a defense cooperation agreement.<sup>28</sup> AoA methods must acceptably treat the disparate precision and confidence about the attributes and data describing the alternatives. It may not be possible to analyze each alternative in equivalent fashion.

Finally, acceptable risk analysis of technology, integration, schedule, and costs requires robust risk analysis techniques and sufficient empirical data about comparable programs. This challenge has spawned an Army wide effort in conjunction with DOD agencies to establish sound risk analysis methods and capabilities.

In the context of these anticipated challenges associated with the new Milestone A AoA paradigm, a brief review of selected completed AoAs provides a useful backdrop to the practical realities of conducting analysis to inform acquisition decisions. An accepted practical maxim in the analysis community is that no two AoAs are alike. The acquisition program parameters and its key decision issues drive the tailoring of each AoA to meet analysis needs.

### AoA Illustrations

The following brief summary provides relevant information about four AoAs the Army completed to inform acquisition management: Comanche, Future Combat Systems (FCS), Joint Light Tactical Vehicle (JLTV), and Ground Combat Vehicle (GCV). The discussion illustrates key points about the analysis work relative to

milestone decisions, relaying practical realities of conducting analyses to inform those program decisions. Two of the four programs were pre-WSARA, one spanned the enacting of WSARA, and another was started post-WSARA implementation. Each illustrates that in practice, program decision needs determine the nature and scope of analysis to inform decisions.

#### Comanche Analysis of Alternatives (AoA)

The Army conducted an AoA from January 1999 to October 2000 to inform a Milestone II (predecessor to current Milestone B) decision for the Comanche program.<sup>29</sup> This synopsis illustrates the impact of long development timelines and the attendant changes in program parameters. The AoA responded in part to a DOD Inspector General (IG) audit report recommendation founded on an assessment that the 1991 Cost and Operational Effectiveness Analysis (COEA), predecessor to AoA, was invalid due to a number of subsequent changing factors in the program. Among those changes were “procurement quantities, costs, threats, capabilities, and alternatives.”<sup>30</sup> The 1991 COEA had informed a 1995 Milestone I decision for the Comanche program. The Acquisition Decision Memorandum (ADM) required the Army to develop COEA guidance to support the Milestone II decision, at that time scheduled for October 2001.<sup>31</sup> To clarify, the term Analysis of Alternatives effectively replaced COEA with the publishing of revised DOD guidance in 1996.<sup>32</sup>

The Comanche AoA completed in 2000 was a significant analytical effort that updated the 1991 COEA, specifically focusing on the program changes mentioned above to inform the upcoming Milestone II decision. The scope of the analysis included examining a wide range of future warfighting settings and missions, using high and low resolution modeling and simulation tools to assess four alternative solutions.<sup>33</sup> The

results of the AoA confirmed that the Comanche new start materiel solution was the most cost and operationally effective solution among the alternatives to satisfy the Army's aerial armed reconnaissance requirement.<sup>34</sup> The 1991 COEA, akin to a Milestone A AoA, was dated to the point of uselessness to inform the next milestone decision. The scope of the 2000 Comanche AoA was similar but benefitted from data and program information almost ten years matured relative to the 1991 COEA. Contrasting the effects of a long Comanche development timeline, the FCS Milestone B AoA was notable for the scope of analysis effort in a compressed timeline.

#### FCS Analysis of Alternatives (AoA)

The FCS AoA underpinned a May 2003 Milestone B decision for the FCS program to enter System Development and Demonstration (SDD).<sup>35</sup> The most complex AoA ever undertaken by the Army, it analyzed a proposed new networked enabled family of systems on a compressed schedule. As the AoA executive summary report indicates, in extremely atypical fashion, the AoA was "conducted concurrently with...concept development, requirements determination and system definition."<sup>36</sup> The scope of the effort was unparalleled compared to previous Army AoAs.

The AoA comprised seven distinct subanalyses and employed 50 models and simulations to examine seven alternative solutions in nine future operational scenarios, using over 10,000 hours of record wargaming. Conducted in about half the time of a typical AoA,<sup>37</sup> the FCS AoA benefitted from a significant body of knowledge developed by the Army Transformation efforts of the late 1990s and early part of the 2000s, including conceptual work of the Army After Next (AAN) wargame series and development of the Stryker force. Unique collaborative efforts among Army organic analytical organizations and four industry teams contributed additional foundation to

new system design concepts.<sup>38</sup> The compressed AoA timeline would not have been feasible without this prework. The milestone decision which approved program entry into SDD acknowledged the AoA would be the foundation for continued analysis during SDD.<sup>39</sup> The FCS AoA informed the decision for the FCS program to enter the acquisition system at Milestone B, not Milestone A.

The AoA was unique for the magnitude of its scope and in that it analyzed alternative solutions concurrent with development of knowledge that typically precedes the AoA. The collective set of circumstances associated with FCS program initiation and its Milestone B AoA had never occurred before and has not since. The Joint Light Tactical Vehicle (JLTV) program and the associated AoA were somewhat more deliberate in comparison, but the JLTV also illustrates how the decision needs of programs shape the AoA and other analysis to inform program management.

#### Joint Light Tactical Vehicle Analysis of Alternatives (AoA)

The Army and Marine Corps conducted the JLTV AoA from January 2009 to July 2011, over a period that spanned the enactment and early implementation of WSARA. The AoA was intended to inform a January 2012 JLTV Milestone B decision. The JLTV AoA final report document reveals that the AoA was in fact “the third in a series of studies to inform the Services’ overall tactical wheeled vehicle acquisition strategy.”<sup>40</sup> The first in the series was a 2006-2007 OSD directed Joint Light Tactical Mobility (JLTM) Evaluation of Alternatives (EoA) to inform the JLTM concept decision. The EoA was an OSD analysis concept pilot designed to serve in lieu of an AoA to inform early concept decisions. The EoA informed JLTV Capability Development Document (CDD) development and assessed how well candidate alternatives might meet CDD requirements.<sup>41</sup>

As the second study in the series of three, the Army conducted an attribute balancing analysis (ABA) in 2008 which “examined the relationships among key JLTV attributes and revealed the implications of trade-offs...and the cost-effectiveness of those trades.”<sup>42</sup> Developers were confronting the somewhat immutable laws of physics based relationships among protection, payload and performance. The work suggested the cost of a new start vehicle might be lowered by relaxing CDD attribute values, thereby making the program more affordable.

Following the ABA, the JLTV AoA considered an initial set of 27 candidate tactical wheeled vehicles and evaluated them in eight operational vignettes depicting a full spectrum of operational settings and hybrid threats. The analytical methods employed included using two combat models to assess operational effectiveness, 14 models for performance analysis and three seminar wargames featuring participants with extensive operational experience in Operations Iraqi Freedom and Enduring Freedom. The AoA concluded that even though a JLTV new start vehicle consistently outperformed other candidate solutions, it was unaffordable given the per vehicle cost target.<sup>43</sup> In the context of its conclusions, the AoA identified three acquisition options the Services might reasonably pursue.<sup>44</sup> In the conduct of its study activities and in its final reporting the AoA reflected compliance with relevant WSARA requirements related to milestone decisions. As with the Comanche and FCS AoAs, the JLTV AoA illustrates how program decision issues shape analysis needs. The physics based iron triangle relationships among protection, payload and performance requirements proved the key determinant in identifying the more cost effective wheeled vehicle solution. Key decision issues required fully understanding those relationships and drove the scope and focus

of the analysis. The body of wheeled vehicle analysis conducted during 2006 to 2008 was the critical foundation for conducting the Milestone B AoA. Similarly, the Ground Combat Vehicle (GCV) AoA leveraged work associated with the Army's combat vehicle modernization efforts in the wake of the June 2009 cancellation of the FCS manned ground vehicle (MGV) program.

#### Ground Combat Vehicle Analysis of Alternatives (AoA)

Coincident with cancelling the FCS Brigade Combat Team (BCT) acquisition program, the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD AT and L) directed the Army to transition to a modernization effort comprised of a number of integrated acquisition programs. Among USD AT and L guidance was direction for one major defense acquisition program (MDAP) to develop ground combat vehicles. Subsequently the Army announced a BCT modernization strategy which included as a key tenet, development of a GCV concept.<sup>45</sup> Efforts focused on identifying capability shortcomings in the infantry fighting vehicle (IFV) fleet and documenting the requirements for a new GCV. In December 2009 the JROC approved a GCV ICD and in February 2010, OSD CAPE issued guidance directing the Army to conduct an AoA to inform a GCV program Milestone A decision. AoA results reported to OSD CAPE in August 2010 deemed a government offered GCV design alternative superior in performance but at high risk relative to affordability. Those results spawned revision of the GCV acquisition strategy and the Army identified an affordability cost target for the GCV. Subsequently, the Army conducted a requirements versus technology trade assessment founded substantially on the original GCV work. During September and October, the AoA team conducted performance and operational effectiveness analysis



in support of the trade assessment and included the trade impact analysis in final AoA reporting.<sup>46</sup>

The GCV AoA was directed, planned and conducted in a post WSARA enactment environment. It complied with all relevant provisions of WSARA.<sup>47</sup> The Army's experience with the GCV AoA provided a practical foundation for identifying challenges with DOD policy and WSARA provisions for a mandated AoA at Milestone A. In after action review (AAR) fashion, the Army used the AoA as a vehicle to engage and provide informal feedback to OSD CAPE on the topic.<sup>48</sup>

While it was conducted in relatively rapid fashion and informed the GCV Milestone A decision, the substance of the AoA was more characteristic of what had come to be expected for AoAs informing a Milestone B decision. As suggested briefly above, the AoA effort benefitted somewhat by prior efforts associated with the Army's combat vehicle modernization work in the wake of the FCS MGCV cancellation. Though it is not uncommon to leverage the continuity of related efforts, the team may not have been able to meet such an aggressive timeline without a head start.

The GCV AoA demonstrated each of the three Milestone A AoA challenges briefly discussed earlier in this paper. The most pointed illustrations were the need to develop adequate concept models for the new start GCV alternative and the challenges to equivalently treat NDI and COTS/GOTS candidates.

The discussion about the GCV, Comanche, FCS and JLTV AoAs differentiates practice from theory in the management of analysis informing acquisition program decisions. Program decision issues should and do determine analysis needs and focus. The Army's relatively recent experience with the GCV AoA and its substantial core

competence in planning and conducting AoAs postures it well to influence continued implementing policy and the guidelines which can help shape expectations about the provisions of WSARA and the mandated Milestone A AoA.

### Review of Existing AoA Policy Guidance

Cognizance of currently published authoritative policy and guidance about AoAs is critical to achieving shared understanding among stakeholders and effectively implementing the WSARA AoA mandate. For the purpose of evolving the AoA process for the better,<sup>49</sup> the Army's Training and Doctrine Command (TRADOC) reviewed policy and implementing guidance about AoAs in the DOD 5000 series of documents, WSARA, the Defense Acquisition University (DAU) Guidebook and practical application to identify inconsistencies, ambiguities, and conflicts. The review indicated some areas lacked "sufficient clarity and are open to different interpretations."<sup>50</sup> It identified two key problems arising from standing regulatory guidance and another recurring one associated with OSD-CAPE developed guidance for the conduct of specific AoAs.

First, the various published guidance documents don't clearly describe and differentiate the purpose and scope of the AoA among milestone decisions. Existing guidance offers a single general AoA description; the DOD 5000.02 introduces it in discussing the MSA phase. The defined scope describes nearly all the potential areas that the series of AoAs might address over the life of an acquisition program. Since the nature of decision issues are different at each milestone, AoA policy and guidance should recognize the differences and relate descriptions of purpose and scope of the associated with each milestone.<sup>51</sup>

Second, in some instances the term materiel solution is used interchangeably with the term alternative, without clearly defining the terms. Accompanying language in

adjacent text suggests an inconsistent interpretation of the term materiel solution. Because the level of knowledge matures during the acquisition process, materiel solutions require unique definition for each milestone's AoA.<sup>52</sup>

A third problem is a pervasive one associated with specific AoA guidance which burdens the AoA with reporting requirements more appropriately the requirement of the Program Manager (PM) or Acquisition Executive (AE). Often the AoA timeline is incompatible with provision of the information in support of the PM or AE reporting. Such redundancy merits closer consideration and standing guidance documents should reconcile it relative to clearly assigning appropriate responsibilities.<sup>53</sup>

The greater body of the information resulting from this review and practical experience of planning and conducting AoAs in the post-WSARA environment provided the Army AoA stakeholders the opportunity to engage OSD-CAPE to seek better “ways to serve the Milestone A decision point.”<sup>54</sup> Such engagement holds promise for the Army to shape the process environment in which it plans and conducts analysis to inform acquisition decisions. Success will be measured by the degree to which OSD and Army acquisition officials share the understanding and accept the practical expectations that the following section of the paper describes.

#### Expectations for a Milestone A AoA<sup>55</sup>

It is practical to define expectations for pre-Milestone A analysis in the current acquisition environment. The fundamental decision for the milestone is what materiel solution(s), if any, should enter technology development (TD) for competitive prototypes. The AoA informing this decision should deliver:

- Evidence of operational consequences of not meeting capability gaps

- Identity of key technologies to close recognized capability gaps
- Technology performance estimates
- Identity of cost drivers
- Identity of key risks (technologies and integration, schedule, and cost)
- A cost target that considers affordability
- Identity of relevant impacts of trading technology for lower costs (gap mitigation, performance, effectiveness).

The AoA should recommend the most cost effective technologies to pursue in the TD phase. Its analysis should be sufficiently robust to identify the important attributes and threshold values for a draft CDD, provide sufficient information to develop a request for proposal for competitive prototypes, and inform a technology development strategy.

The analysis environment is characterized by immature requirements knowledge and new technologies that may still be in development. This requires representing candidate solutions as developmental technologies, representing existing technologies applied to modernize existing systems or representing existing technologies used to form new start systems. Among these technology representations are those associated with non-developmental items (NDI) or COTS systems. Foreign government developed NDI can be especially challenging. Components seek knowledge about potential solutions directly from industry through RFI or contracted efforts to define concepts concurrent with MSA.

The set of AoA alternatives considered may range from paper design concepts to fielded capabilities. The associated wide variety of confidence about attribute definition and performance estimates may result in the inability to treat alternatives equitably.

Solution alternatives possess attributes that potentially close or mitigate capability gaps in a JROC approved ICD.

To effectively implement WSARA, OSD and the Army must achieve an end state where the consumers of the analysis informing milestone decisions distinguish the parameters and expectations for MSA from the purpose and scope of the Milestone B AoA (or an update). In contrast to Milestone A, by the time for a Milestone B decision, with the AoA emerging results feeding the CDD drafting, the milestone decision authority should expect these deliverables: confirmation of cost target and key attributes, results of performance trades to meet cost target, estimates of performance and effectiveness, higher confidence estimates of costs, and a resource informed basis of issue plan.

#### Resourcing the Army's AoAs

A complete solution to implementing WSARA includes considering resourcing the new paradigm. Parallel to shaping expectations for the Milestone A AoA among the DOD community is an imperative to adequately provision the organizations most affected by the WSARA mandate. In response to WSARA, the OSD staff is seeking more robust effort up front, with greater analytic rigor to assure well informed program decisions. Relative to pre-WSARA environments, AoAs for Milestone A are becoming more complex with increased and earlier engagement by the organic Army organizations in acquisition decision analysis related to Materiel Development Decisions (MDD), MSA, and CDD drafting and maturation, leading to Technology Development and Milestone B.

Strategic leaders ensure sufficient resourcing of means to achieve envisioned ends. Historically, the Army has underfunded its AoA mission. The scope of the effort is

known. Documented levels of effort by Army analytical organizations indicate an approximate \$20M annual shortfall in AoA mission funding during the first decade of this century.<sup>56</sup> A Secretary of the Army chartered acquisition review panel endorsed the requirement and recommended full funding of the missions of the Army's principal AoA performing organizations.<sup>57</sup> Recognizing the ineffectiveness of recurring ad hoc unfinanced requirement drills in the year of execution which were burdensome and unsynchronized with program and budget gates, and anticipating the increased need associated with WSARA, the Army staff took the initiative to partially fund these activities. Especially within looming fiscally constrained environments, the quality of resource informed decisions will be critical. Robust analysis to inform decision making in an era of reduced budgets will be at greater premium than ever. The Army should fully fund its organic analytical organizations conducting newly mandated acquisition decision support analyses. The marginal investment will pay dividends as the DOD pursues a strategic change to a cost conscious culture.

### Conclusions

The Administration, Congress and Department of Defense leaders had high hopes for WSARA when President Obama signed it into law just two days after Senator John McCain issued a floor statement in its support.<sup>58</sup> In his May 2012 progress report on WSARA, David Berteau observes that "Expectations ran high for WSARA. Introduced in early 2009...the final bill was enacted less than four months"<sup>59</sup> later. Everyone seemed to agree on the need to improve defense acquisition and that WSARA was an important step. Peter Eide and Chuck Allen offer that it aimed "to improve the likelihood of success of major program acquisitions by focusing on decisions at their inception."<sup>60</sup> WSARA constitutes clear communication of strategic

intent from the nation's leaders. DOD's leaders are obliged to effect the intended change in culture to improve how DOD makes business investment decisions in terms of weapons development and procurement.

Whether it is still too early to make a reliable assessment about achieving that aim<sup>61</sup> or concluding as do Eide and Allen that "the prospects for lasting reform are gloomy,"<sup>62</sup> there remains compelling evidence for the need to improve the operation of the Department's weapons acquisition processes. In the Army alone, over \$1B a year in Development Test and Evaluation (DT and E) funding has been lost due to program cancellations since 1996. Since 2004, the annual loss ranges between \$3.3B and \$3.8B. Even without accounting for the substantial loss associated with cancelling the FCS program, the Army lost 25% of its annual DT and E funding due to program cancellations since 1996. Viewed as lost opportunity, in terms of equipment for Soldiers the DOD has little tangible to show for this money spent.<sup>63</sup> WSARA is a worthwhile attempt to better steward defense dollars associated with acquisition decision making. Regarding the mandated Milestone A AoA, there is an opportunity to examine and improve processes effecting the earliest decisions in the acquisition timeline.

The Army's relatively recent experience with the GCV AoA and its substantial past history in conducting AoAs and other acquisition related activities are strengths in efforts to improve DOD acquisition. Applying its core competence in planning and conducting AoAs, the Army has an opportunity to shape the effectiveness of fully implementing the new AoA related provisions of WSARA through narrowly focused but important changes.

To effectively implement WSARA, OSD and the Army must gain shared understanding of the nature of pre-Milestone A analysis to enable close working relationships which ensure AoAs informing milestone decisions are acceptable and useful to senior leaders. Making cost conscious, resource informed acquisition decisions are intermediate objectives which contribute to achieving strategic goals.

The AoA mandate helps effect WSARA's intent to strengthen oversight and accountability to monitor and control costs in DOD weapons systems purchases. Expectations of earlier and robust analysis in this vein must match the nature of knowledge of systems or capabilities under consideration.

Despite the potential for introducing organizational friction, the WSARA mandate for an AoA at Milestone A and reassignment of leadership for AoA guidance are sufficiently significant changes to merit expanding AoA guidelines in formal policy documents to ensure shared understanding, consistent enforcement of standards, and common expectations across DOD. Previous OSD and Army guidance included more detailed policy guidance on the conduct and form of AoAs than exists in current policy documents.

To influence policy for improving acquisition decision making, the Army must engage OSD and include the Army's AoA stakeholders to align efforts for doing analysis in smarter and more relevant ways to serve the Milestone A decision point.<sup>64</sup> Leaders within the bureaucracy that is the DOD can model and effect change by establishing and enforcing standards of performance. Regarding the WSARA mandated AoA at Milestone A, there are positive and concrete steps the Army can take to improve defense acquisition processes.



## Recommendations

The Army and OSD should undertake these three recommendations for effectively implementing the specific WSARA mandate for an AoA at Milestone A:

1. In conjunction with the OSD staff, the Army should continue to evolve informal engagement with OSD-CAPE to implement the range of recommendations<sup>65</sup> resulting from the post-GCV AoA AAR to reconcile inconsistencies, ambiguities and conflicts among published policy.
2. The Army should formally engage OSD and the other Services to collaborate development and publishing of authoritative general guidelines for conducting and using analysis of alternatives to inform acquisition milestone decisions. Revision of the DOD Instruction 5000.02 is a candidate vehicle for this.
3. The Army should fully implement the Decker-Wagner<sup>66</sup> recommendations related to funding for organic Army analysis organizations which are the principal performers of AoAs.

The first two recommendations would enable common understanding and shared expectations among the OSD and Service acquisition and analysis communities relative to the constituents and nature of the mandated Milestone A AoA. Achieving these goals would optimize the benefit to the Army and effect the WSARA envisioned improvement to this specific aspect of the DOD acquisition processes.

The third recommendation would ensure the Army establishes predictable funding to commit mission resources early with capability developers for materiel related analysis mandated by WSARA, JCIDS and DOD 5000 to support Department of the Army acquisition decisions.

## Endnotes

<sup>1</sup>Barrack H. Obama, Barrack H. Obama, "Remarks by the President at Signing of the Weapons Systems Acquisition Reform Act", May 22, 2009, <http://www.whitehouse.gov/the-press-office/remarks-president-signing-weapons-systems-acquisition-reform-act> (accessed March 6, 2013).

<sup>2</sup>U.S. Department of Defense, Defense Acquisition University, *Defense Acquisition Guidebook*, October 9, 2012, <https://acc.dau.mil/CommunityBrowser.aspx?id=488336&lang=en-US> (accessed March 6, 2013).

<sup>3</sup>This contention attributed to E.W. Rogers and R. P. Birmingham by Peter K. Eide and Charles D. Allen, "The More Things Change, Acquisition Reform Remains the Same," *Defense Acquisition Research Journal*, 19, no. 1 (January 2012): 114.

<sup>4</sup>C. B. Cochrane, "The 5000 Process: 1971 to 2008," briefing charts in slideshow format, February 19, 2009. This document reviews the significant changes to the Defense Acquisition System as represented by changes to the DOD 5000 series of regulatory guidance documents.

<sup>5</sup>The term analysis of alternatives as part of the Cost as an Independent Variable (CAIV) process appeared in and effectively replaced Cost and Operational Effectiveness Analysis (COEA) in the mid-1990s with the publishing of revised DOD guidance in 1996. U.S. Department of Defense, *Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS) Acquisition Programs*, DOD Regulation 5000.2-R (Washington, DC: U.S. Department of Defense, March 15, 1996), Part 2, 4.

<sup>6</sup>*Weapon Systems Acquisition Reform Act of 2009 (WSARA)*, Public Law 111-23, 111th Cong. 1st sess. (May 22, 2009), 18.

<sup>7</sup>U.S. Department of the Army, "2nd and 3rd order effects of the Weapons Systems Acquisition Reform Act (WSARA) to the execution of Analysis of Alternatives (AoAs)," information paper, Office of the Deputy Chief of Staff G-3/5/7, Capabilities, Integration, Prioritization and Analysis, September 27, 2011; Michael J. Moore, e-mail to author, March 5, 2013.

<sup>8</sup>*Ibid.*

<sup>9</sup>U.S. Department of Defense, *Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS) Acquisition Programs*, DOD Regulation 5000.2-R (Washington, DC: U.S. Department of Defense, March 15, 1996), Part 2, 4; Office of the Inspector General, *Acquisition Management of the Comanche Program* (Arlington, VA: U.S. Department of Defense, No. 99-021, November 4, 1998), 14.

<sup>10</sup>U.S. Department of Defense, *Defense Acquisition Management Documents and Reports*, DOD Manual 5000.2-M (Washington, DC: U.S. Department of Defense, February 23, 1991), Part 8.; U.S. Department of Defense, *DRAFT Cost and Operational Effectiveness Analysis (COEA) Guidelines*, DOD 5000.1-G (Washington, DC: U.S. Department of Defense, Office of the Assistant Secretary of Defense (Program Analysis and Evaluation), February, 1990).

<sup>11</sup>U.S. Department of Defense, *Operation of the Defense Acquisition System*, DOD Instruction 5000.02 (Washington, DC: U.S. Department of Defense, December 8, 2008), 14-16.

<sup>12</sup>*Ibid.*, 15.

<sup>13</sup>*Ibid.*, 19.

<sup>14</sup>*Ibid.*, 34.

<sup>15</sup>The succeeding discussion related to six categories of analysis is substantially from “Acquisition Analysis Contrasts: MSA Phase vs. TD Phase”, briefing chart, May 23, 2011; Michael F. Bauman, e-mail message to Scott Comes, OSD-CAPE, May 26, 2011. In this message, Mr. Bauman relayed the chart which reflected the Army’s experiential thinking about major contrasts between analysis during the Material Solutions Analysis (MSA) phase (“the AoA”) and that which follows during the Technology Development (TD) phase. The product and correspondence were part of a larger Army AoA community engagement with OSD CAPE and USD (AT&L).

<sup>16</sup>Christine H. Fox, “CAPE: A New Name for an Enduring Role,” *The Armed Forces Comptroller*, 55, no. 2 (Spring 2010): 17-22, in ProQuest (accessed February 8, 2013).

<sup>17</sup>*Ibid.*

<sup>18</sup>*Ibid.*

<sup>19</sup>*Ibid.*

<sup>20</sup>U.S. Congress, Senate, Committee on Armed Services, *Hearing to Consider the Nomination of Mrs. Katharina G. McFarland to be Assistant Secretary of Defense for Acquisition*, 112th Cong., 2d sess., March 29, 2012.  
<http://search.proquest.com.ezproxy.usawcpubs.org/docview/992862502> (accessed February 8, 2013).

<sup>21</sup>*Ibid.*

<sup>22</sup>*Ibid.*

<sup>23</sup>*Ibid.*

<sup>24</sup>*Ibid.*

<sup>25</sup>*Ibid.*

<sup>26</sup>*Ibid.*

<sup>27</sup>The succeeding discussion about Milestone A AoA challenges is substantially from Michael F. Bauman, Allan M. Resnick, and Michael A. Vane, “Analysis of Alternatives (AoA) Review,” briefing charts dated May 2, 2011, Arlington, VA, Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, Pentagon, April 25, 2011. Content presented

to Mr. Kendall, Under Secretary of Defense for Acquisition, Technology and Logistics on April 25, 2011.

<sup>28</sup>U.S. Department of Defense, Defense Acquisition University, *Glossary of Defense Acquisition Acronyms and Terms, Fourteenth Edition*, July, 2011, <https://dap.dau.mil/glossary/Pages/2294.aspx> (accessed March 11, 2013).

<sup>29</sup>William R. Richardson and Crosbie E. Saint, "Why Comanche?," *Army* (August 2002): 26.

<sup>30</sup>Office of the Inspector General, *Acquisition Management of the Comanche Program* (Arlington, VA: U.S. Department of Defense, No. 99-021, November 4, 1998), 14.

<sup>31</sup>*Ibid.*, 16.

<sup>32</sup>The term analysis of alternatives as part of the Cost as an Independent Variable (CAIV) process appeared in and effectively replaced Cost and Operational Effectiveness Analysis (COEA) in the mid-1990s with the publishing of revised DOD guidance in 1996. U.S. Department of Defense, *Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS) Acquisition Programs*, DOD Regulation 5000.2-R (Washington, DC: U.S. Department of Defense, March 15, 1996), Part 2, 4.

<sup>33</sup>Jimmy Downs, "What Right Looks Like: Comanche First Army Program to Use Analysis of Alternatives (AoA) Methodology," *Program Manager* (September-October 2000): 64.

<sup>34</sup>Richardson and Saint, "Why Comanche?," 26.

<sup>35</sup>Michael F. Bauman, *Future Combat Systems (FCS) Analysis of Alternatives Executive Summary* (Ft. Leavenworth, KS: U.S. Army TRADOC Analysis Center, May 14, 2003), 1.

<sup>36</sup>*Ibid.*, 2.

<sup>37</sup>*Ibid.*, 3.

<sup>38</sup>*Ibid.*, 1.

<sup>39</sup>*Ibid.*, i.

<sup>40</sup>Brenda Schmalsteig, *Joint Light Tactical Vehicle Analysis of Alternatives Final Report* (Ft. Leavenworth, KS: U.S. Army TRADOC Analysis Center, August 31, 2011), ES-1.

<sup>41</sup>*Ibid.*, 1-2.

<sup>42</sup>*Ibid.*, 2.

<sup>43</sup>*Ibid.*, ES-1.

<sup>44</sup>*Ibid.*, ES-2 to ES-3.

<sup>45</sup>U.S. Under Secretary of Defense for Acquisition, Technology, and Logistics, "Future Combat Systems (FCS) Brigade Combat Team (BCT) Acquisition Decision Memorandum,"

memorandum for the Secretary of the Army, Washington, DC, June 23, 2009; Andrew Feickert and Nathan Lucas, *Army Future Combat System (FCS) "Spin-Outs" and Ground Combat Vehicle (GCV): Background and Issues for Congress* (Washington, DC: U.S. Library of Congress, Congressional Research Service, November 30, 2009, 4-5.

<sup>46</sup>This paragraph substantially paraphrased from Garrett R. Lambert, *Ground Combat Vehicle (GCV) Analysis of Alternatives (AoA) Final Report* (White Sands Missile Range, NM: U.S. Army TRADOC Analysis Center, November 30, 2011), 2.

<sup>47</sup>U.S. Congress, Senate, Committee on Armed Services, *Hearing to Consider the Nomination of Mrs. Katharina G. McFarland*.

<sup>48</sup>Michael F. Bauman, e-mail message to Honorable H. Christine Fox, May 6, 2011. This communication included the briefing charts and two word documents which constituted content the Army discussed with Mr. Kendall (USD-ATL) on 25 Apr 11; Michael F. Bauman, e-mail message to Scott Comes, OSD-CAPE, May 26, 2011. In this message, Mr. Bauman relayed a briefing chart which reflected the Army's experiential thinking about major contrasts between analysis during the Material Solutions Analysis (MSA) phase ("the AoA") and that which follows during the Technology Development (TD) phase.

<sup>49</sup>*Ibid.*

<sup>50</sup>U.S. Army Training and Doctrine Command, "TRADOC Assessment: AoA Guidance in DOD 5000 Series, WSARA and In Practice," white paper, Ft. Leavenworth, KS, U.S. Army TRADOC Analysis Center, May 2, 2011, 1.

<sup>51</sup>*Ibid.*

<sup>52</sup>*Ibid.*, 2.

<sup>53</sup>*Ibid.*, 1.

<sup>54</sup>Michael F. Bauman, e-mail message to Honorable H. Christine Fox, May 6, 2011.

<sup>55</sup>The succeeding discussion about Milestone A AoA expectations is substantially from a combination of two sources, Michael F. Bauman, Allan M. Resnick, and Michael A. Vane, "Analysis of Alternatives (AoA) Review," briefing charts dated May 2, 2011, Arlington, VA, Office of the Under Secretary of Defense for Acquisition, Technology and Logistics), Pentagon, April 25, 2011. Content presented to Mr. Kendall, Under Secretary of Defense for Acquisition, Technology and Logistics on April 25, 2011; U.S. Army Training and Doctrine Command, "TRADOC Recommended Changes to DOD AoA Guidance," white paper, Ft. Leavenworth, KS, U.S. Army TRADOC Analysis Center, April 21, 2011, 2-3.

<sup>56</sup>Michael F. Bauman and W. Forrest Crain, "New AoA Funding Paradigm," briefing charts, Arlington, VA, Office of Assistant Secretary of the Army for Acquisition, Logistics and Technology), Pentagon, October 9, 2009. Presentation to Mr. Mullins and Mr. Steenrod. Updated December 31, 2010 to reflect information for fiscal years 2010 and 2011.

<sup>57</sup>Review chartered by Secretary of the Army, John M. McHugh and conducted by panel of six members selected for depth of experience in various aspects of the Army acquisition

system. Gilbert F. Decker and Louis C. Wagner, *Army Strong: Equipped, Trained and Ready: Final Report of the 2010 Army Acquisition Review* (Washington, DC: U.S. Department of the Army, January 2011), 74.

<sup>58</sup>Eide and Allen, "The More Things Change," 106.

<sup>59</sup>David J. Berteau, Joachim Hofbauer, and Stephanie Sanok, "Implementation of the Weapon Systems Acquisition Reform Act of 2009 Progress Report," May 26, 2010, 3. <http://csis.org/files/publication/20100528%20WSARA%20Progress%20Report.pdf> (accessed October 10, 2012).

<sup>60</sup>Eide and Allen, "The More Things Change," 106.

<sup>61</sup>Berteau, Hofbauer, and Sanok, "Implementation of the Weapon Systems Acquisition Reform Act of 2009 Progress Report," 3.

<sup>62</sup>Eide and Allen, "The More Things Change," 114.

<sup>63</sup>Decker and Wagner, *Army Strong*, x.

<sup>64</sup>Michael F. Bauman, e-mail message to Honorable H. Christine Fox, May 6, 2011.

<sup>65</sup>Bauman, Resnick, and Vane, "Analysis of Alternatives (AoA) Review,"; U.S. Army Training and Doctrine Command, "TRADOC Recommended Changes to DOD AoA Guidance".

<sup>66</sup>Decker and Wagner, *Army Strong*, 74.